Student based funding in higher education systems with declining and uncertain enrolments: the Portuguese case

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Abstract:

Higher education systems have generally been adapting to increasing demand, higher quality requirements and severe financial constraints. In Portugal, where public funding critically depends on the new enrolments, the short term uncertainties of declining applications exacerbate systemic long term underfunding certainties. Unfavourable demographics explain most, but not all, recent negative trends in demand for higher education. In such uncertain context strategic planning is difficult, and predicting new enrolments, and thus the volume of public funds, became a new and major challenge for universities. This paper proposes an empirical analysis of demand’s main determinants, allowing a more precise picture of future enrolments and funding.

JEL Classification: I20; I22, I28

Key words: demand for higher education; determinants of university participation; financing higher education; enrolments forecasting.

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**Introduction**

After half a century of dictatorship, when access to higher education was restricted to a handful of students from the social and economic elite, Portugal experienced a massive educational expansion in the last quarter of the twentieth century. In this period, the country displayed the highest OCDE growth rate of university enrolments, with an annual compound rate close to six per cent and an almost sevenfold increase in the number of applications. Supply gradually adapted to this increasing demand, with new public universities created outside the main population centres and the development of a wide network of polytechnic institutions. A system of *numer clausi* constrained access to public institutions, encouraging the emergence of numerous private institutions which absorbed most excess demand.

Unexpectedly for most, by the mid nineties the total number of candidates fell around forty per cent, and has since followed a wobbly downward trend. Democracy, education and economic development had also affected the traditional family structure, with a sharp reduction in birth rates. Despite their efforts, all Portuguese institutions have experienced a significant drop in applications, and vacant places can be found in many programmes across most universities. A direct financial impact of the decline in applications was immediately felt. First, public funding, almost exclusively based on the number of students, fell dramatically. Recent regulations have even denied funding to programmes unable to attract a minimum of 20 new students each year. Second, own revenues from tuition fees, albeit still at very low values, have also consequently fallen. To add injury to serious damage, all this occurred whilst the Bologna guidelines were being adopted in Portugal, thus reducing the extension of first degrees, from the traditional four or five, to three years’ cycles, and immediately cutting at least a quarter of state funding. Suddenly, the institutions realised the need for enrolment projections in financial planning, a concern for long in the US but mostly neglected in Europe. Since demographics do not fully explain the evolution of new enrolments, as illustrated by an unexpected positive reversal in the most recent figures, a more comprehensive understanding of the dynamics behind the numbers is required.

Demand for higher education has been extensively studied since the publication of Campbell and Siegel’s (1967) seminal work, although the literature widely differs in scope, motivation, focus and methodological approach. Some papers estimate national or regional demand functions, and are especially concerned with funding issues and the optimal number and geographical dispersion of institutions. Most of these authors focus on the US (see, for example, Campbell and Siegel, 1967, Galper and Dunn, 1969, Radneer and Miller, 1970 and Corazzini et al. 1972) although studies may also be found for Greece (Psachropoulos and Soumelis, 1979), Belgium (Duchesne and Nonneman, 1998) and Canada (Christofides et al. 2008b). Other papers, also centred on the US, focus on demand for a particular institution, on what motives
or inhibits students to favour a specific university, as a useful tool for institutional strategic planning (e.g. Hoenack, Weiller 1979, Fuller et al. 1982, Leppel, 1993, DesJardins et al. 1999, Buss et al. 2004, and Chen and Chung, 2006). With a completely different purpose, a few analyses aim at identifying demand for a certain scientific area (e.g. Freeman, 1971 or Rego and Caleiro, 2004), either to adjust supply or to induce demand towards what are considered key strategic areas.

Some other papers are primarily motivated by social concerns in the access process to higher education, in terms of a particular aspect of potential economic discrimination, such as household income, student aid, tuition and other costs (Fuller et al. 1982, MacPherson and Schapiro, 1991 and Buss et al. 2004, for the US), social discrimination, either in class, gender or ethnicity (Wetzel et al. 1998, Sissoko and Shiau, 2005, Christofides et al. 2008a), or geographical discrimination, namely due to travel and accommodation costs (Sá et al. 2003, for the Netherlands).

A separate distinction must also be drawn between student choice and student demand models. While the latter employ aggregate data (examples include Campbell and Siegel, 1967, Galper and Dunn, 1969, Hoenack and Weiler, 1979, and Duchesne and Nonneman, 1998), the former focus on the individual, using large longitudinal survey data and logistic regression techniques (see Radner and Miller, 1970, Corazzini et al. 1972, Christensen et al. 1975, Psacharopoulos, Soumelis, 1979, Fuller et al. 1982, MacPherson and Schapiro, 1991, Leppel, 1993, Des Jardins et al. 1999 and Christofides et al. 2008b, among others).

Finally, while most papers are concerned with testing hypotheses of demand behaviour, very few have attempted to go a step further and present precise enrolment projections. Some decades ago, Hoenack and Weiler (1979) and Ahlburg, Crimmins and Easterlin (1981) presented such projections for the US, based on econometric models. More recently, Murdoch and Hoque (1999) use a simple extrapolation of trends, focusing exclusively demographic factors, to project enrolments, also in the US.

The approach in our paper differs in several aspects. Firstly, the characteristics of the Portuguese system of student recruitment differs from most formats analysed before, notably the US system. The application process is centralised, supply is constrained by numeri clausi, institutions are almost exclusively publicly funded and tuition costs are not significant. A direct consequence is the use of data on candidates and not on enrolments as in most previous studies. Secondly, we are primarily concerned with a decreasing demand for higher education, its impact on university budgets and on the optimal number and distribution of institutions. Thirdly, in methodological terms, two possible modelling approaches are consecutively explored, by extracting information from longitudinal survey data to enrich an aggregate demand model. Finally, demand projections are presented for the next eighteen years, based on the results of the estimated econometric model.
These projections are increasingly valuable for the higher education institutions, in terms of budget planning, enrolment management, tuition setting, staff management and other resource allocation decisions. They are also crucial for central planning, to substantiate funding, tuition and recruitment policies, the optimal design of the higher education system, and to anticipate the overall effects of academic qualifications on economic development. Demand forecasts are particularly important in a system with *numeris clausi*. On the one hand, it may be necessary to increase supply of places in the academia, to avoid social frustration of students unable to enter university. On the other hand, it may be necessary to adopt policies that increase the participation rate, to prevent major financial disruption in many institutions.

The empirical analysis to uncover the dynamics behind the demand for higher education is developed in three stages. A first, exploratory analysis, investigates data from a survey on household income and living conditions with the purpose of identifying some factors influencing young people’s decision to enter higher education. The micro variables identified as significant are used, together with other macro determinants traditionally found to be important in the literature, in the estimation of a number of alternative demand models. As expected, both demographic and socioeconomic factors are found to be statistically significant. The resulting regression estimates are then exploited in a tentative forecast of demand. The projections suggest that, although an inversion of the recent downfall in enrolments is expected, the figures will not soon revert to those observed in the mid nineties. This hypothetical scenario has evident policy implications in terms of funding rules and of the necessary policies to increase student’s willingness to attend tertiary education.

The remainder of the paper is organised as follows. The next section provides a theoretical foundation for the empirical model and briefly surveys the literature on the determinants of demand. Section two describes the recent evolution of higher education in Portugal. Section three develops the empirical model that allows forecasting demand for the next few years. Concluding remarks are provided in the final section.

1 The economics of demand for higher education

The individual decision to apply to a higher education institution is influenced by a variety of psychological, sociological, political and economic factors and is the outcome of a rational assessment process, also observed in other choice contexts. It may therefore be analysed from an economics perspective, for example under the postulates of the neoclassical consumer theory, according to which utility maximiser consumers choose the best bundles of goods they can afford. In this context, each decision results from the juxtaposition of personal preferences and budgetary considerations. The former define what is best for each person, while the latter limit
the capacity to *afford*, depending on the available income and on the expenses involved in acquiring the goods.

Following this rationale, higher education is demanded by those who consider it useful and, simultaneously, can afford it. Demand is thus expected to be positively influenced by the level of individual or family income and negatively by the costs directly and indirectly involved. Income and costs are the objective determinants of the individual budgetary restriction. Preferences, on the other hand, are determined both by subjective and objective considerations, varying from a personal inclination towards studying to the influence that public opinion campaigns, or family and friends, may exert in the process of choosing between further study and an immediate professional career.

As a degree is often a pre-condition to a satisfying and relatively better remunerated professional life, alternative perspectives, regarding higher education not as a consumption good but as an investment, may also be considered in analyses of demand for higher education. Examples are Becker’s (1964) theory of human capital, or Spence’s (1973) signalling theory. In Becker’s view, the objective of attending higher education is to accumulate knowledge and competences that increase personal productivity and improve the probability of getting better paid jobs. Consequently, the short-run opportunity costs are compensated by higher returns throughout the professional life.

Spence considers education as a way of sending quality signals to potential employers which, in a context of asymmetric information, cannot *a priori* select the more productive employees. Education may thus be a proxy for individual capacities and a university degree may be a way of distinguishing amongst job candidates and separating those who probably deserve better paid occupations from the potentially less productive.

Early empirical analyses, as the studies of demand for higher education in the US developed by Campbell and Siegel (1967), or by Hight (1975), were based on the neoclassical economics approach. More recent work, especially when focused on the returns to education, considers instead the human capital or the signalling approaches.¹ Despite the initial theoretical distinction between consumer and investment motives for higher education, richer models, combining both arguments, have also been formulated and tested. These consist of either introducing investment motivations into the neoclassical consumer approach or of extending the human capital approach with consumption aspects. Duchesne and Nonneman (1998) survey this literature and suggest that it is impossible to empirically distinguish between the integrated consumption-investment and the extended human capital theories, as both lead to an intertemporal consumption problem where agents maximise their current and future consumption, subject to an intertemporal budget constraint. From this integrated perspective, demand is determined by

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¹ A thorough survey of such literature is provided by Harmon, Oosterbeek and Walker (2003).
individual intertemporal preferences, where the degree wage premium may play an important role, and by other variables also influencing the intertemporal budget constraint, such as income and costs.

From both the neoclassical and the intertemporal perspectives, demand for higher education may be represented by a demand function, as it represents the relationship between demand for one good or service and the set of variables influencing consumers’ willingness and ability to consume it. In the specific case of higher education, the relevant variables in the individual demand function are, for example, the direct price (tuition fees), individual or family income, the price of complements such as accommodation, transportation, meals, books and other materials, the price of substitutes, and specific factors directly related to personal preferences. The latter determine the relative weight of higher education’s opportunity costs and future benefits.

In theoretical terms, the summing up of individual demand behaviour leads to the aggregate demand for higher education, which encapsulates both personal tastes and expectations, and income and cost restrictions. In practice, the exact determinants of aggregate demand and the impacts of their change are an empirical issue that depends on a variety of factors, and is sensitive to geographic and societal specificities. The intrinsic variability of such determinants and their relevance for governments and institutions justify the attention that such issues have been attracting and make the need to anticipate the number of future enrolments more pressing. One possibility is to entirely rely on simple demographic projections. The number of births in a particular year will have a direct effect on demand and allows projections for an eighteen years horizon. The current Portuguese negative trend in candidates certainly reflects decreasing birth rates since the early sixties. However, this correlation may not be sufficient to explain overall trends, since, as noted above, other factors may also influence demand.

An important factor is how successful the educational system is in carrying students till the end of secondary education. Despite the considerable progress already achieved, a significant number of Portuguese students do not conclude basic compulsory education, and those attaining higher secondary education are less than half the corresponding age group. Public policies aiming at reducing drop-out rates and increasing academic success in primary and secondary education play an important role in delivering students at the door of universities.

Social and cultural factors must also be considered. In Portugal, female participation rates in primary and secondary education have been relatively stable, but have increased substantially in tertiary education until the mid nineties. It has also been shown that the probability of attending higher education is highly correlated with the parents’ educational attainment, not only due to financial factors but also to an increased awareness of the benefits of education (Gayle et al. 2003). Hertz et al. (2007) find evidence of this educational persistence effect in a large sample.
of forty countries, Portugal not included, but also observe large regional differences in the results.

Additionally, economic factors may play an important role. Household income influences the decision to send the offspring to the university and depends on the economy’s performance in terms of GDP growth and unemployment rates. Furthermore, when weighing the expected financial costs and benefits, families consider the wage premium of graduates over foregone earnings (e.g. Jacob 2002, or Tao 2006). In this respect, it may also be important to consider, on the one hand, social support policies for students from lower income families and, on the other hand, the value of tuition fees. Buss et al. (2004) report a significant effect of tuition fees on enrolment in the US, but weak evidence on the role of macroeconomic factors. Christofides et al. (2008b) also find evidence of this effect in Canada, but Canton and de Jong (2005) find that, in the Netherlands, applications are not responsive to fees, possibly due to their low level and generous student support (Sá et al. 2003). In Portugal, tuition costs are still relatively recent and low, and are not expected to prevent access as lower income families are exempt.

Finally, some supply factors should also be considered, namely the existence of a geographically disperse network of institutions. The financial costs of a degree increase with the distance to the household, due for example to rental and transportation expenses. Christofides et al. (2008a) find evidence of this effect in Canada, and Sá et al. (2003) in the Netherlands.

2 Higher education in Portugal: evolution and main determinants

Until the mid seventies, only four public and one private university existed in Portugal, in a highly selective and elitist system. The transformation began in 1973 and gained impetus with the following year’s demise of the political regime. Applications for higher education soared and had to be restrained by a numeri clausi system. In the following years, a continuously increasing demand, not fulfilled by the public university sector, led to the creation of many private institutions and polytechnic schools. By 1986, a binary higher education structure was implemented, distinguishing between university and polytechnic education. Such quantitative and qualitative changes shaped the Portuguese system of higher education, currently characterised by a multiplicity of public and privately offered degrees. In geographical terms, the allocation of institutions and degrees is mainly determined by demographic factors, aggravating the already evident economic asymmetries between North and South, and coastal and interior regions.

As reported in figure 1, rising demand, though inconstant, was sustained until 1995, and supply tried to keep the pace, with an increasing number of institutions, degree programmes, staff and infrastructure. Suddenly, the situation was inverted from 1995 onwards, probably as a result of more restrictive access conditions and especially of the demographic evolution. The number of
places continued to grow, but demand decreased, lagging behind supply from 2001 onwards. Whereas by the mid nineties the number of applications was 2.4 times higher than the available places, this figure decreased in ten years to 0.84 in 2005. The recent slight recovery in the number of applicants may be due to the adoption of the ‘Bologna Process’, which involved major adaptations of structure, contents and especially duration of study programmes, mainly in the first cycle.

There are only two publicly available documents, both developed in the nineties, forecasting higher education applicants in Portugal. The current higher education minister coordinated a large research group in charge of elaborating projections for the following ten years of higher education in Portugal (Gago, 1994). Their projections for the evolution of candidates were solely supported by the expected attendance rate in the 12th year of schooling, and were largely over-optimistic, as shown in figure 1, with a 54% revision error in 2003, for example. Explicitly disregarding demographic trends, the authors argued that social and economic factors would continue to drive demand upwards.

More recently, Amaral and Teixeira (1999) presented more accurate, although less ambitious, forecasts for the following five years. Considering the impact of lower birth rates on primary and secondary education attendance, the authors forecasted a slight negative trend in the number of higher education candidates, even so less pronounced than the real figures would later demonstrate.

Figure 1: Forecasted and actual demand for Higher Education in Portugal, 1977-2007 (10^3)
3 Empirical assessment of higher education determinants

Exploratory analysis

As noted above, the literature has shown that the decision to enrol in higher education is significantly influenced by household income and parents’ educational attainment. In order to assess whether the same phenomena occurs in Portugal, the database from the ‘Survey on Income and Living Conditions’ (SILC) for 2006, the most recent year available, is examined. Table 1 reports the estimation results from a standard logit model, appropriate when dealing with binary variables. The dependent variable is whether young adults aged 17-29 have concluded or are attending higher education. The first two regressors reflect whether their fathers, and mothers, hold a high education degree. The results confirm the major significance of the intergenerational persistence effect in educational attainment, and corroborate OECD (2007, p. 119) data, showing that Portuguese students are about 3.2 times more likely to attend higher education if their fathers hold a university degree, the highest ratio in the ten analysed EU countries.

Since the SILC database does not publicly display household income, two proxy variables have been employed. The first is the household’s degree of ease or difficulty to cope with all the usual living expenses (ranging from 1–with great difficulty, to 6–very easily). The second proxy of family income is housing tenure, whether the dwelling is owned or rented (see Gayle et al. 2003). Both variables are statistically significant, again confirming OECD (2007, p. 116) conclusions that Portuguese students from a blue-collar background are about one-half as likely to be in higher education.

Table 1: Exploratory logit model: parameter estimates

<table>
<thead>
<tr>
<th>Variables</th>
<th>Parameter estimates</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Father with HE degree</td>
<td>2.0653***</td>
<td>Number of observations: 1047</td>
</tr>
<tr>
<td></td>
<td>(0.5543)</td>
<td>Log-likelihood value: -603.586</td>
</tr>
<tr>
<td>Mother with HE degree</td>
<td>1.4525***</td>
<td>Pseudo $r^2$: 0.129</td>
</tr>
<tr>
<td></td>
<td>(0.3883)</td>
<td>RESET test ($p$-value): 0.4751</td>
</tr>
<tr>
<td>Capacity to cover costs</td>
<td>0.4559***</td>
<td>LR test ($p$-value): 0.000</td>
</tr>
<tr>
<td></td>
<td>(0.0727)</td>
<td>Pearson goodness-of-fit test ($p$-value): 0.311</td>
</tr>
<tr>
<td>Housing tenure</td>
<td>0.7053***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.2027)</td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>-2.5628***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.2623)</td>
<td></td>
</tr>
</tbody>
</table>

Notes: standard errors shown in parenthesis below the coefficients. The asterisks indicate significance at the 1% levels. Data sources: National Statistical Institute, Survey on Income and Living Conditions 2006.
The model fits reasonably well. The parameter estimates of logit models are not easily interpreted, but their function here was basically to identify important determinants to employ in the standard linear regression model estimated below. A RESET test was conducted to test the hypothesis of no misspecification of the econometric model. The test statistic of 1.49 is clearly below the critical value, showing no evidence of misspecification of the binary logit model.

**The empirical demand function for higher education**

The conclusions obtained with the logit model are important to correctly design the demand function for higher education in Portugal. As shown, the model should incorporate both the parents’ education level and some measure of their income. Population with a higher education degree is included as a proxy for the former, and the GDP and GDP per capita real growth rates, or the unemployment rate, for the latter. On top of these socioeconomic variables, demographic trends usually explain most variations in demand for higher education, particularly where the focus of student recruitment is almost exclusively domestic, and have the advantage of being observable almost two decades before impact. To account for the demographic effect, neglected in most seminal work in this area (see Blaug, 1976), the model includes the evolution of live births in Portugal eighteen years before, the usual age of access. The models have also been estimated substituting the lagged number of births by the current population at the age of entering higher education, and the results are very similar. Using the actual number of births has the advantage of allowing projections eighteen years ahead using actual figures, instead of less reliable population projections.

Finally, another important determinant is the academic success rate at the pre-higher education levels. Given the several important changes in the Portuguese educational structure within the analysed time frame, it is difficult to collect homogeneous data for educational attainment in primary or secondary education. The completion rate in the 12th year, immediately preceding higher education, is therefore considered.

Throughout the time period under analysis, several legislative changes have occurred, to restrain or promote admissions in higher education, according to the evolution of the system’s capacity: changes in *numeri clausi*, more or less restrictive admission requirements, imposition or withdrawal of minimum grades, tuition fees, social support policies, or approval of new public and private institutions. In order to acknowledge their impact on demand, a number of dummy variables have been included in the models, but mostly were not statistically significant and did not qualitatively alter the results.

The sample covers the period from 1977 to 2007. The beginning of the sample was chosen to coincide with a major structural break in the time series, caused by the generalisation of the *numeri clausi*, the introduction of a transition year (the 12th year of schooling) and the creation
of polytechnic institutions. The econometric specification for the more general multiple regression model is the following:

\[ cand_i = \beta_0 + \beta_1 \text{births}_{i-18} + \beta_2 \text{popHE}_i + \beta_3 \text{economy}_i + \beta_4 \text{success}_{i-1} + \beta_5 t_i + D, \]

where \( cand \) is the (log) number of candidates to higher education, \( \text{births} \) are the (log) number of live births eighteen years before, \( \text{popHE} \) is the (log) population with a degree, \( \text{economy} \) stands for either the economy’s real GDP growth rate, or per capita GDP, or its unemployment rate, \( \text{success} \) refers to the previous year (log) academic success in the 12th year, \( t_i \) is a time trend which captures the rapidly increasing participation rates following the country’s democratisation process, and \( D \) are possible dummy variables to account for particular events or policy measures with a potential one-off effect on demand.

The estimation results for different model specifications, using simple ordinary least squares, are displayed in table 2. The dependent variable is the number of candidates applying in the nation-wide selection system for a place in a public higher education institution. Although most papers prefer enrolment figures instead of candidates, the latter variable is more appropriate in Portugal, given that enrolments are constrained by a system of \textit{numeri clausi}. All variables, apart from growth rates, are in logs, allowing their estimated coefficients to be interpreted as elasticities.

Augmented Dickey-Fuller (ADF) tests for unit roots have been performed on all variables and the evidence points to stationarity, although in some cases only after allowing for a structural break in the trend, corresponding to the period identified as \textit{trend1} in three of the models in Table 2.

The \textit{Cook-Weisberg} test for heterocedasticity, the \textit{Ramsey} \textit{RESET} test for the functional form and the \textit{Durbin-Watson} test for autocorrelation were performed for all models. Before including the trend, tests on models (1) and (2), did not reject the null hypotheses of constant variance and no omitted variables, but the Durbin-Watson test rejected the null of zero autocorrelation. The alternative version of model (4), with no trend, also displayed heterocedasticity problems. To solve them, a trend for the period 1977-1995 was included in the equations, and the resulting estimations, displayed in table 2, are free of autocorrelation, heteroscedasticity and omitted variables’ problems.

This trend captures other socioeconomic factors that could not be modelled but led to the convergence of higher education participation rates to the EU average, particularly bolstered by a rapid increase in the women’s participation rate, socially restrained until mid seventies. In fifteen years, the women’s share in the higher education population increased also fifteen percentage points, from 41% to 56%, stabilising thereafter around this value, which corresponds to the EU 55% average, according to Eurostat data.
Table 2: Regression estimates of alternative demand functions

<table>
<thead>
<tr>
<th>variables</th>
<th>model</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$R^2$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td></td>
<td>-24.2940**</td>
<td>1.7171***</td>
<td>1.0925***</td>
<td>0.0407**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(8.893245)</td>
<td>(0.5903)</td>
<td>(0.1496)</td>
<td>(0.0157)</td>
</tr>
<tr>
<td>Live births (t-18)</td>
<td></td>
<td>-25.3347***</td>
<td>1.7832***</td>
<td>1.1132***</td>
<td>0.0424**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(8.9072)</td>
<td>(0.5903)</td>
<td>(0.1505)</td>
<td>(0.0158)</td>
</tr>
<tr>
<td>Population with HE degree</td>
<td></td>
<td>-28.068***</td>
<td>1.9386***</td>
<td>0.8648***</td>
<td>0.0424**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(8.3690)</td>
<td>(0.5514)</td>
<td>(0.1642)</td>
<td>(0.0158)</td>
</tr>
<tr>
<td>Real GDP growth rate</td>
<td></td>
<td>-25.933***</td>
<td>1.7412***</td>
<td>1.0071***</td>
<td>0.0340**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(8.2606)</td>
<td>(0.5449)</td>
<td>(0.1467)</td>
<td>(0.0145)</td>
</tr>
<tr>
<td>GDP per capita real growth rate</td>
<td></td>
<td>0.8700</td>
<td>0.8648***</td>
<td>0.8648***</td>
<td>0.0188**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.5903)</td>
<td>(0.1496)</td>
<td>(0.2225)</td>
<td>(0.0065)</td>
</tr>
<tr>
<td>Unemployment rate</td>
<td></td>
<td>-0.0564**</td>
<td>0.6333**</td>
<td>0.1793***</td>
<td>0.0282***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.2711)</td>
<td>(0.2328)</td>
<td>(0.0225)</td>
<td>(0.0065)</td>
</tr>
<tr>
<td>Academic success 12th year</td>
<td></td>
<td>0.0291***</td>
<td>0.6333**</td>
<td>0.1793***</td>
<td>0.0282***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.0065)</td>
<td>(0.0065)</td>
<td>(0.0225)</td>
<td>(0.0065)</td>
</tr>
</tbody>
</table>

Notes: standard errors shown in parenthesis below the coefficients. The asterisks indicate significance at the 10%(*), 5%(**) and 1%(***), 1% levels, respectively. Data sources: 1National Statistical Institute (INE); 2OECD; 3Bank of Portugal; 4Office for Education Statistics and Planning (GEPE).

All models appear to fit the data very well, especially model (4). The independent variables are highly statistically significant, display the expected signs, and explain ninety per cent of the variation in the (log) number of candidates. The estimates of the variables representing economic conditions and the share of population with tertiary education are also consistent and reinforce the conclusions obtained by the logit model.

A dummy variable was introduced to investigate the impact of the Bologna reforms, but it was not statistically significant. It is probably too soon to assess the impact of Bologna on demand, although evidence for other countries suggests a positive impact (accounting for a ten per cent increase in Italy, for example, according to Cappellari and Lucifora, 2008).

**Demand for higher education in the next eighteen years**

The estimates obtained in model (4) and projections of the independent variables are utilised to forecast demand. For the first variable, the number of births, current observable data allow projections for the next eighteen years. For the population with a higher education degree, the maintenance of the present increasing trend is assumed. Given the current wide gap between the share of population with tertiary education in Portugal and the EU average, for example, this
seems to be a realistic assumption. According to OECD data, the share of Portuguese population aged 25-64 with a higher education degree was 13% in 2005, half the average values of 26% in the OECD countries and 24% in the EU.

There are several forecasts for the GDP real growth rate, from international institutions such as the IMF, the OECD or the European Commission. Yet, these forecasts only go as far as 2013. From then on, a two per cent average growth rate, the long-run rate for the EU considered by the European Central Bank is assumed.

Forecasting the academic success rates for the 12th year is a much more difficult task, depending on a number of hard to predict factors. However, disregarding the first few years in the sample, when this transition year was introduced in the system and its academic success rates were very low, this variable has been quite stable in Portugal. Therefore, the average value observed in the last decade is imposed on this variable.

Since the dependent variable is in logs, exponentiating the predicted value for the log of candidates would systematically underestimate the expected number of candidates. The estimates have therefore been scaled up using the usual technique of multiplying by a factor obtained from an auxiliary regression.

Figure 2: Number of candidates to higher education, actual and forecasted (10^3)

The results of the forecasting exercise are exhibited in figure 2. They display relatively constant numbers of possible candidates during the next five years, an increasing trend until the end of the next decade, and a slightly decreasing trend afterwards.

Since the analysis includes forecasted values of the explanatory variables, alternative scenarios may be constructed. The curve may shift downward if economic conditions remain as negative as during the past decade, when the Portuguese economy diverged from the EU average, or it can move upwards if convergence is achieved in the near future. It will also increase if upper
secondary education success rates improve significantly, above those registered during the past ten years. It is also unclear, as noted above, what the effects of the Bologna reforms will be.

On the other hand, there may be some other exogenous factors affecting demand in the future, such as a more extensive de jure and de facto compulsory education, enhancements in student social support policies or student loan programmes, major migration inflows, or any other unexpected event. Projections of future demand may even eventually precipitate a change in higher education policies.

**Concluding Remarks**

Unlike many other higher education systems, concerned with rising flows of new students and with the choices of how to collect the necessary extra funding for such increasing demand, Portuguese institutions are currently struggling to cope with a negative trend in the number of new students and the consequent income shortages due to a predominantly student based funding system. OECD (2007) data shows that, from 1995 to 2004, only Spain experienced a fall in the number of students in tertiary education. However, public funding in neighbouring Spain continued to grow and, therefore, total expenditure per student has significantly increased in this period. The nature of the Portuguese public funding system, on a per student basis, is reflected on a stable expenditure per student, which greatly compromises higher education institutions’ financial and functional viability when the number of students decreases but fixed costs persist.

The statistical models estimated in this paper suggest that the evolution of demand has been largely influenced by demographic and socioeconomic factors. The changing population structure, with a considerable decrease in the number of people of university age, has not been completely offset by a higher participation rate, resulting in negative trends of new students during the last decade.

Enrolment projections are therefore critical for strategic financial planning, both at the government and individual institutions levels, particularly in these higher education systems where funding is granted by formulas that attach an almost exclusive weight on total enrolled students. The number of university age students will continue decreasing. This demographic effect may be offset by a higher participation rate, depending on social and cultural factors, higher success rates in compulsory and secondary education, and better economic prospects. Our forecasts, built on the estimated coefficients of the statistical model and on projections of the explanatory variables, suggest that the number of candidates will stabilise during the next five years, follow an upward trend afterwards, until falling again after 2018.
Further research is needed on this subject, and it will be particularly important to observe the impact of the Bologna reforms on demand for higher education. Shortening the time period required to obtain a degree may positively affect demand, by reducing the price and opportunity costs of attending higher education. The empirical analysis could also be enriched by investigating the importance of further possible determinants of demand, such as the wage premium.

With the prospects of timid increases in demand for the next few years, and a strong reliance on government sources of funding, either current financing rules change or some institutions will have to close or merge to survive. Competition for new students will also intensify among institutions, with increased awareness of the importance of quality, marketing and ranking lists. The other alternative is to implement urgent and effective policies to widen the admission base and attract more students, especially from lower income and less educated backgrounds. Active financial measures may include expanding social support for students from lower income families, or a more attractive publicly-backed loan system. However, the students’ willingness to borrow depends on the perceived financial gains from higher education, which also require more active information policies on the benefits of education.

The margin for increasing participation rates is still wide, since Portugal is at the top of the list of OECD countries with lower tertiary education attainment. But the margin for increasing public funding is also wide. Eurostat data shows that, compared to GDP per capita, expenditure per student in higher education in Portugal is the second lowest in the EU25, and less than half the value in the United States.

References:


